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EXAMINER

SONG, MATTHEW J

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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/726,370
Filing Date: December 03, 2003
Appellant(s): TAKAMI, TOMOHIDE

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Jeffrey H. Rosedale
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 8/15/2007 appealing from the Office action mailed 8/16/2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

US 5,858,862	Westwater et al.	1-1999
US 5,381,753	Okajima et al.	1-1995

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

- Claim 3 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 3 requires a joint having a diameter less than that of the portions of the nanofiber preceding and following the joint. The original specification merely provides support for a constriction. There is no support for a joint having a diameter less than the portions preceding and following a joint.
- Claim 5 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 5 recites, "the diameter of the nanofiber is approximately equivalent to the size of the microcrystal grain" in lines 1-2. The original specification teaches applying grains to form nanowires and the nanofiber is composed of a plurality of nanowires. The grain is approximately the size of the nanowire, not the nanofiber.
- Claims 1-4 and 6-9 are rejected under 35 U.S.C. 102(b) as being anticipated by Westwater et al (US 5,858,862).

Westwater et al teaches a method of producing silicon nanowires which are grown into desirable shapes as to be uniform in diameter without any bending (abstract). Westwater et al teaches silicon nanowires bundled in the same direction with a space between nanowires, such that a nanofiber has a stem shaped cross-sectional configuration, note Figure 3 and 4. Westwater et al's Figure 1C and 3 are similar to applicant's Figure 1C; therefore Westwater et al teaches a stem shaped cross sectional configuration.

Referring to claim 2, Westwater et al teaches the base of the nanowires has a larger diameter than the upper portion of the nanowire (Fig 3). The upper portion which is narrower reads on applicant's joint portion shaped like a constriction where a diameter is smaller.

Referring to claim 3, Westwater teaches nanowires having a bottom portion having a large diameter than a middle portion and an upper portion of the nanowire having a diameter large than the middle portion, note Fig 3, this middle region reads on applicant's joint having a diameter less than that of the portions of the nanofiber preceding and following the joint.

Referring to claim 4 and 6-9, claims 4 and 6-9 further limit the product claim by specific the method of manufacturing. The patentability determination of a product-by-process claim is based on the patentability of the product and does not depend on its method of production (MPEP 2113). Westwater discloses all of the claimed product limitations; therefore meets the claimed limitations because the method of production is not given patentable weight.

- Claims 1-2 are rejected under 35 U.S.C. 102(b) as being anticipated by Okajima et al (US 5,381,753).

Okajima et al teaches a method of producing silicon needle like crystals, which grown in a vertical direction only at a place where a liquid drop is situated on a silicon substrate (col 4, ln 45-60), this reads on applicant's nanowires. Okajima et al teaches silicon nanowires bundled in the same direction with a space between nanowires, such that a nanofiber has a stem shaped cross-sectional configuration, note Figure 1(b). Okajima et al's Figure 1(b) is similar to applicant's Figure 1C; therefore Okajima et al teaches a stem shaped cross sectional configuration.

Referring to claim 2, Okajima et al teaches the base of the silicon needle like crystal has a larger diameter than the upper portion of the needle like crystal, note figure 1(b). The upper portion which is narrower reads on applicant's joint portion shaped like a constriction where a diameter is smaller.

(10) Response to Argument

Rejection of claim 3 under 35 U.S.C. § 112, First Paragraph

Appellant alleges that support for the claimed limitation, "the joint having a diameter less than that of the portions of the nanofiber preceding and following the joint", is found on page 10, lines 26-29 of the specification and Figure 4. The cited portion of the specification merely teaches "the diameter of silicon nanofiber 4 will be configured with small joint." However, this language in the specification does not provide support for the claimed limitation, and merely provides support for a small joint. The "small joint" does not provide support for the diameter of the nanofiber preceding and following the joint. "Small joint" can be interpreted to mean its length, i.e. short joint.

In regards to Figure 4, the portion of the nanofiber that appellant indicates as the joint does not support the language used in the claim regarding the diameter of the portions of the nanofiber preceding and following the joint. First, there is no support in the Figure of the specification that the portion indicated by appellant is the joint discussed in the specification. Second, while a slight indentation may exist at the portion indicated by appellant (note the full sized figure 4, rather than the smaller copied image in the brief), it appears that portions also bulges out on the opposite side of the indentation, thus it is impossible to determine whether the diameter portion of the joint has a smaller diameter than the portions preceding and following the joint based on Figure 4 and the discussion of Figure 4 in the specification.

It should also be noted that appellant does teach the joint portion is shaped like a constriction where a diameter is smaller, however there is no disclosure of the diameter of nanofiber following the joint portion. There is no disclosure that the portion of the nanofiber increases in diameter following the joint. Based on Appellant's figure 4, it appears that the upper portion after the portion alleged by appellant to be the joint actually is of smaller diameter than the bottom portion or the joint portion.

Rejection of claim 5 under 35 U.S.C. § 112, First Paragraph

Appellant's argument that the specification teaches the "size of the silicon microcrystal grain 2 and the diameter of silicon nanofiber 4 becomes nearly equal" is noted but not found persuasive. The Examiner maintains that despite the literal support in the specification for this process limitation in a product claim, appellant lacks possession of the invention as claimed because the invention cannot perform as claimed. The nanofiber is formed of a plurality of

nanowires. The nanowires, which form the nanofiber grow separately, as indicated by Figure 3, thus the nanofiber has a diameter approximately equivalent to the sum of diameters of the nanowires.

Rejection of claims 1-4 and 6-9 under 35 U.S.C. § 102(b) over Westwater.

Claims 1 and 2

The arguments by appellant are primarily directed to the difference between a nanofiber, which is a bundle of nanowires, and the teachings of Westwater that teaches a band of substantially parallel nanowires, which the reads on appellant's bundle because the ordinary meaning of bundle is a band of mostly parallel fibers. The primary issue is the definition of bundle. It is the Examiner's position that appellant has used the term "bundle" without defining in the specification any meaning that would be contrary to the ordinary meaning of a small band of mostly parallel fibers, and bundle does not carry any special meaning in the art that would differ from the meaning of bundle used by the Examiner. Thus the band of parallel nanowires reads on appellant's bundle of nanowires, which thus reads on appellant's nanofiber. It is noted that Appellant's Figure 3, merely shows a plurality of nanowires that form the nanofiber, which resembles the teachings of the Westwater reference. Appellant never addresses the interpretation of "bundle" used by Examiner and the Appellant merely alleges that the Westwater references fails to teach bundling, which Appellant characterizes as a process limitation in the claims directed toward a product.

Appellant's argument that Westwater does not teach how such bundling might be performed and how such bundling might be performed to produce a stem shaped nanofiber is

noted but not found persuasive. First, these features are not claimed. How bundling occurs is a method limitation and the claims on appeal are product claims. Second, bundling occurs simply by depositing catalyst and having a plurality of nanowires grow parallel to one another. The stem shaped cross section is merely a group of the nanowires having such a cross section, which is taught in Figure 3 of Westwater, which teaches a plurality of nanowires.

In response to appellant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the bundling of the silicon quantum fine wires to form a nanofiber (pg 6 of the brief)) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). The claims are to a product and "bundling" would be a process limitation, which is not recited in the claims. The claims merely require a bundle of nanowires, which Westwater teaches in Figure 3, because the Examiner's definition of bundle is merely a band of parallel fibers. It is noted that appellant does not claim or teach any particular feature for bundling the nanowires to form a nanofiber.

Appellant's argument regarding the comparison of the Westwater figures and appellant's figures is noted but not found persuasive. The Examiner's position in comparing the figures is to show what was a stem shaped cross section. However, appellant's figure 3 does not show a nanofiber with step shaped cross section, merely a plurality of nanofibers. It is noted that stem shaped cross section is not clearly defined in appellant specification and only the plain meaning can be used, in other words the shape is one that resembles a plant stem. Appellant's point is moot however because Westwater teaches a plurality of nanowires in Figure 3. Westwater

clearly teaches at least a band or group of the nanowires that would have a stem shaped cross section.

Claims 3, 4, and 6-9

The arguments by appellant are directed primarily to the term joint. The Examiner's position is that the Westwater reference teaches the claimed features of the joint. The portion of the nanowires taught by Westwater clearly teaches a top and bottom portion that have a diameter greater than the middle portion, thus meets the claimed limitation. Appellant merely alleges that the portion that the Examiner characterizes as the joint is not in fact a joint as intended, but Appellant does not allege any actual structural differences between the prior art and the instantly claimed invention.

Appellant's argument that the joint is a result of a heat releasing process is interposed between two separate heating process and each heating process results in vertical growth of the nanofiber is noted but not found persuasive. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). The process limitations are not recited in the claims on appeal. Also, Westwater teaches a portion joint of the nanowire has a smaller diameter than the portions preceding and following the smaller diameter portion of the nanofiber, thus Westwater teaches the claimed structure.

In response to appellant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which appellant relies (i.e., joint as defined in the application is interposed between elongated portions of the nanofiber) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification,

limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Appellant's application does not redefine "joint" to mean a portion between elongated portion of a nanofiber. Appellant merely teaches a joint portion shaped like a constriction where the diameter is smaller, note appellant's claim 2. Westwater teaches a portion that is wide at the base then constricts during a main elongated portion then expands at the top, wherein the smaller diameter main portions reads on appellant's joint.

Appellant's argument that "small joint" could not mean the elongated middle portion of Westwater is noted but not found persuasive. First, appellant does not claim a small joint. Second, appellant's disclosure does not even teach that "small" means relative to the total size of the nanofiber, as alleged. The specification merely teaches "small" without characterizing in what aspect of the joint is small. Finally, all the entire invention is on nanometer size so everything about the invention is small.

Appellant's argument that the flared caps and flared bases of the structures formed by Westwater is not considered by the drafters of Westwater to be part of the quantum fine wires (i.e. of the nanowire) is noted but not found persuasive. First it is noted that appellant's admit that Westwater teaches flared caps and flared bases, thus the middle portion has a smaller diameter than the flared caps and flared bases, which meets the joint limitation. Second, appellant's rationalization that Westwater teaching that the diameter of the wire is dependant on the diameter of the alloy drops implies that the flared portions are not part of the nanowire is not persuasive. It cannot be inferred that having a diameter nanowire dependant on the alloy droplet means that the portions of the base and top of the nanowire. Finally, Appellant cannot take away from the fact

the nanowire structure taught by Westwater has flared top and bottom portions with a smaller diameter portion between the flared portions, which reads on the features of claim 3.

Appellant's argument that joints of Westwater are not joint because they are not optional portions that are introduced via deliberate intervention is noted but not found persuasive.

Whether the features are optional or not does not take away from the fact that Westwater discloses the claimed structure. Appellant continually argues method limitations which are not recited in the claimed invention (i.e. produced by a heating process), however the claim is directed to a product and the Westwater patent discloses the claimed structure of the nanofiber.

Appellant's argument that Westwater teaches nanowires, not nanofibers with a joint portion is noted but not found persuasive. The Examiner's position is that the nanowires taught by Westwater all having the same features of a flared base and flared top with a smaller diameter portion between the flared portion, as depicted in Figure 3. It is also the Examiner's position that because a nanofiber is merely a plurality of nanowires, that the nanofiber would also have the flared top and bottom portions, thus the nanofiber has joint, as required by claim 3. Appellant alleges that the Examiner has not provided any technical data or explanatory art, thus the argument is merely conjecture. However, based on Figure 3 of Westwater is clear that all of the nanowires have flared top and bottom portions with smaller diameter middle portions. Therefore, since the nanofiber is merely a plurality of the nanowires, the nanofiber necessarily will have top and bottom flared portions. It is unclear how the nanofiber would not have these portions and why any reference would be need to show what is clearly evidenced in Westwater's Figure 3. It is also noted that appellant's claim 3 does not require any "bundling", thus arguments directed to bundling are not persuasive.

Rejection of claims 1-2 under 35 U.S.C. § 102(b) over Okajima.

Appellant's argument that the Okajima patent does not teach nanofibers is noted but not found persuasive. Appellant correctly identifies that the Examiner compared Okajima's Figure 1(b) to appellant's Figure 1C, which do not show the same features. The Examiner's position in comparing the figures is to show what was a stem shaped cross section. However, appellant's figure 3 does not show a nanofiber with step shaped cross section, merely a plurality of nanofibers. It is noted that stem shaped cross section is not clearly defined in appellant specification and only the plain meaning can be used, in other words the shape is one that resembles a plant stem. Okajima teaches a stem shaped cross section because the plurality of nanowires in Figure 1(b) resembles a plant stem. The nanowires taught by Okajima are oriented parallel to one another in Figure 1(b). The nanofiber claimed by appellant is merely a bundle of nanowires, which taught by Okajima because a bundle is merely a band of mostly parallel fibers. The pattern of nanowires taught by Okajima reasonably resembles a plant stem thus meets the claimed limitation of a stem cross section. While appellant does acknowledge the error in the supplemental reasoning used by Examiner to further support the stem shaped cross section, the teachings of Okajima are still able to anticipate appellant's invention without the comparison of figures.

Appellant's argument that Okajima does not teach how such bundling might be performed and how such bundling might be performed to produce a stem shaped nanofiber is noted but not found persuasive. First, these features are not claimed. How bundling occurs is a method limitation and the claims on appeal are product claims. Second, bundling occurs simply by depositing catalyst and having a plurality of nanowires grow parallel to one another. The stem

shaped cross section is merely a group of the nanowires having such a cross section, which is taught in Figure 3 of Westwater, which teaches a plurality of nanowires.

Appellant's argument that to assert that any conglomeration of the fine structure of needle like crystal would result in a stem shaped nanofiber would be impermissible is noted but not found persuasive. First, the Examiner never suggest that any conglomeration occurs, as alleged by appellant. Second, the Examiner's position is that the mere formation of parallel nanowires is sufficient to read on appellant's "bundling" because appellant does not teach any structural feature for bundling and bundling is merely a process limitation. In regards to the stem shaped nanofiber the placement of the nanowires is such that the plurality forms a stem shaped cross section.

Conclusion

The arguments by appellant are primarily directed to the difference between a nanofiber, which is a bundle of nanowires, and the teachings of Westwater and Okajima that teaches a band of substantially parallel nanowires, which reads on appellant's bundle because the ordinary meaning of bundle is a band of mostly parallel fibers. The primary issue is the definition of bundle. It is the Examiner's position that appellant has used the term "bundle" without defining in the specification any meaning that would be contrary to the ordinary meaning of a small band of mostly parallel fibers, and bundle does not carry any special meaning in the art that would differ from the meaning of bundle used by the Examiner. Also, bundle does not impart any structural feature into the invention. Thus the band of parallel nanowires reads on appellant's bundle of nanowires, which thus reads on appellant's nanofiber. It is noted that Appellant's

Figure 3, merely shows a plurality of nanowires that form the nanofiber, which resembles the teachings of the Westwater and Okajima references. Appellant never addresses the interpretation of "bundle" used by Examiner and the Appellant merely alleges that the Westwater and Okajima references fails to teach bundling, which Appellant characterizes as a process limitation in the claims directed toward a product.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Matthew Song/
Matthew Song

Conferees:

/Michael Barr/

Michael Barr, SPE AU 1792

/Romulo Delmendo/

Romulo Delmendo, Appeals Specialist